nizatidine, norethisterone, norfloxacin, norgestrel, nortriptyline, omeprazole, ondansetron, pancreatin, panthenol, pantothenic acid, paracetamol, phenobarbital, derivatives, metabolites, and other such compounds have similar activity. Some preferred drugs or compounds include, but are not limited to, estrogen, androgen, cortisone, and cyclosporin.

Growth factors useful in the present invention include, but are not limited to, transforming growth factor-α ("TGF-α"), transforming growth factor-β ("TGF-β"), platelet-derived growth factors ("PDGF"), fibroblast growth factors ("FGF"), including FGF acidic isoforms 1 and 2, FGF basic form 2 and FGF 4, 8, 9 and 10, nerve growth factors ("NGF") including NGF 2.5s, NGF 7.0s and beta NGF and neurotrophins, brain derived neurotrophic factor, cartilage derived factor, bone growth factors (BGF), basic fibroblast growth factor, insulin-like growth factor (IGF), vascular endothelial growth factor (VEGF), granulocyte colony stimulating factor (G-CSF), insulin like growth factor (IGF) I and II, hepatocyte growth factor, glial neurotrophic growth factor (GDNF), stem cell factor (SCF), keratinocyte growth factor (KGF), transforming growth factors (TGF), including TGFs alpha, beta, beta1, beta2, beta3, skeletal growth factor, bone matrix derived growth factors, and bone derived growth factors and mixtures thereof.

Cytokines useful in the present invention include, but are not limited to, cardiotrophin, stromal cell derived factor, macrophage derived chemokine (MDC), melanoma growth stimulatory activity (MGSA), macrophage inflammatory proteins 1 alpha (MIP-1alpha), 2, 3 alpha, 3 beta, 4 and 5, IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, TNF-α, and TNF-β. Immunoglobulins useful in the present invention include, but are not limited to, IgG, IgA, IgM, IgD, IgE, and mixtures thereof. Some preferred growth factors include VEGF (vascular endothelial growth factor), NGFs (nerve growth factors), PDGF-AA, PDGF-BB, PDGF-AB, FGFb, FGFa, and BGF.

Other molecules useful as substances in the present invention indude but are not limited to growth hormones, leptin, leukemia inhibitory factor (LIF), tumor necrosis factor alpha and beta, endostatin, thrombospondin, osteogenic protein-1, bone morphogenetic proteins 2 and 7, osteonectin, somatomedin-like peptide, osteocalcin, , interferon alpha, interferon alpha A, interferon beta, interferon gamma, interferon 1 alpha, and interleukins 2, 3, 4, 5 6, 7, 8, 9, 10, 11, 12,13, 15, 16, 17 and 18.

Embodiments involving amino acids, peptides, polypeptides, and proteins may include any type or combinations of such molecules of any size and complexity. Examples include, but are not limited to structural proteins, enzymes, and peptide hormones. These compounds can serve a variety of functions. In some embodiments, the matrix may contain peptides containing a sequence that suppresses enzyme activity through competition for the active site. In other applications antigenic agents that promote an immune response and invoke immunity can be incorporated into a construct.

In substances such as nucleic acids, any nucleic acid can be present. Examples include, but are not limited to deoxyribonucleic acid (DNA), ent-DNA, and ribonucleic acid (RNA). Embodiments involving DNA include, but are not limited to, cDNA sequences, natural DNA sequences from any source, and sense or anti-sense oligonucleotides. For example, DNA can be naked (e.g., U.S. Patent Nos. 5,580,859; 5,910,488) or complexed or encapsulated (e.g., U.S. Patent Nos. 5,908,777; 5,787,567). DNA can be present in vectors of any kind, for example in a viral or plasmid vector. In some embodiments, nucleic acids used will serve to promote or to inhibit the expression of genes in cells inside and/or outside the electroprocessed matrix. The nucleic acids can be in any form that is effective to enhance its uptake into cells.

Cells as a Substance

In embodiments in which cells are a substance, any cell can be used. Cells that can be used include, but are not limited to stem cells, committed stem cells, and differentiated cells. Examples of stem cells that can be used include but are not limited to embryonic stem cells, bone marrow stem cells and umbilical cord stem cells. Other examples of cells used in various embodiments include but are not limited to: osteoblasts, myoblasts, neuroblasts, fibroblasts, glioblasts; germ cells, hepatocytes, chondrocytes, keratinocytes, smooth muscle cells, cardiac muscle cells, connective tissue cells, epithelial cells, endothelial cells, hormone-secreting cells, cells of the immune system, and neurons. In some embodiments it is unnecessary to pre-select the type of stem cell that is to be used, because many types of stem cells can be induced to differentiate in an organ specific pattern once delivered to a given organ. For example, a stem cell delivered to the liver can be induced to become a liver cell simply by placing the stem cell within the biochemical environment of the liver. Cells in the matrix can

serve the purpose of providing scaffolding or seeding, producing certain compounds, or both.

Embodiments in which the substance comprises cells include cells that can be cultured *in vitro*, derived from a natural source, or produced by any other means. Any natural source of prokaryotic or eukaryotic cells may be used. Embodiments in which the matrix is implanted in an organism can use cells from the recipient, cells from a conspecific donor or a donor from a different species, or bacteria or microbial cells. Cells harvested from a source and cultured prior to use are also included.

Some embodiments use cells that have been genetically engineered. The engineering involves programming the cell to express one or more genes, repressing the expression of one or more genes, or both. One example of genetically engineered cells useful in the present invention is a genetically engineered cell that makes and secretes one or more desired molecules. When electroprocessed matrices comprising genetically engineered cells are implanted in an organism, the molecules produced can produce a local effect or a systemic effect, and can include the molecules identified above as possible substances. Cells can also produce antigenic materials in embodiments in which one of the purposes of the matrix is to produce an immune response. Cells may produce substances to aid in the following non-inclusive list of purposes: inhibit or stimulate inflammation; facilitate healing; resist immunorejection; provide hormone replacement; replace neurotransmitters; inhibit or destroy cancer cells; promote cell growth; inhibit or stimulate formation of blood vessels; augment tissue; and to supplement or replace the following tissue, neurons, skin, synovial fluid, tendons, cartilage, ligaments, bone, muscle, organs, dura, blood vessels, bone marrow, and extracellular matrix.

Genetic engineering can involve, for example, adding or removing genetic material to or from a cell, altering existing genetic material, or both. Embodiments in which cells are transfected or otherwise engineered to express a gene can use transiently or permanently transfected genes, or both. Gene sequences may be full or partial length, cloned or naturally occurring.

Substances in the electroprocessed compositions of the present invention also comprise objects. Examples of objects include, but are not limited to, cell fragments, cell debris, organelles and other cell components, tablets, and viruses as well as vesicles, liposomes, capsules, nanoparticles, and other structures that